

Preliminary Host-Specificity Studies on Parasitoids of Olive Fruit Fly

H. Nadel¹, K. Daane¹, C. Funk¹, and C. H. Pickett

The olive fly is being targeted for classical biological control in California, especially in untreated urban olives and abandoned orchards found over much of the state's olive growing regions. An important aspect of the screening process for candidate biocontrol agents is their potential non-target impact on native and beneficial exotic fruit flies. While developing a protocol for host-specificity studies in quarantine, we studied the capacity of some imported fruit fly parasitoids to reproduce on two native and one exotic fruit fly species.

The parasitoids were imported from laboratory colonies in Hawaii. They attack several fruit fly species, including the OLFF. *Fopius arisanus* attacks eggs and emerges from the pupa, while *Psytalia humilis*, *P. concolor*, and *Diachasmimorpha kraussii* attack mainly the third instar, emerging from the pupa.

Two univoltine fruit-feeding native host flies were exposed to the following parasitoids: *Rhagoletis completa* (walnut husk fly) and *R. indifferens* (western cherry fruit fly), and an exotic, multivoltine, seed-head feeder, *Chaetorellia succinea*, which is employed for control of yellow starthistle.

Bitter cherry (*Prunus emarginata*) fruit were picked at various sites in the Sierra Nevada in August 2003 when much of the fruit was ripe. *Rhagoletis indifferens* prefers ripe fruit, but another cherry fly, *R. fausta*, attacks mainly unripe bitter cherry. The larvae of both fruit flies are solitary. The rate of infestation by the fruit flies varied considerably by site but was not determined before the study. A study replicate consisted of about 100 ripe or unripe fruit placed with four female parasitoids in plastic tubs with mesh lids for three days. Few *F. arisanus* females were available, so ripe and unripe fruit were exposed in open tubs inside the colony cage.

English walnuts infested with *R. completa* were collected in Alameda County and four to six walnuts per replicate were offered to about four female parasitoids in plastic tubs with mesh lids. Susceptible host stages were used. The larvae are gregarious, about eight to 15 per fruit. Unfortunately, despite intervention, many of the walnuts rotted, causing considerable mortality of larvae and pupae. Although no parasitoids emerged from surviving pupae, no firm conclusions can be drawn from this part of the study due to the rotting of the walnuts.

Chaetorellia succinea was reared from yellow starthistle inflorescences collected in Yolo County. After a mating and maturation period in cages, a female was isolated in a vial on an intact flower bud for 30 minutes to two days to oviposit, but was not observed. Oviposition by flies could not be confirmed. A female parasitoid was isolated for two to three days in the vial when the eggs or larvae were in susceptible stages. *Psytalia concolor* was not used in this study.

The results are summarized in Tables 1 and 2. The only firm conclusions that can be made are that *P. humilis* and *D. kraussii* are capable of reproducing in larvae of *R. indifferens*. The results suggest that *F. arisanus* and *D. kraussii* cannot reproduce on *C. succinea*, but more data are needed.

Table 1. Results of parasitoid exposure to *Rhagoletis indifferens** in bitter cherry fruit.

	No. Replicates	Total No. Fruit	No. Fly Pupae	No. Parasitoids Emerged	
				Male	Female
Ripe Fruit					
Control	3	425	62	-	-
<i>Fopius arisanus</i>	1	120	31	0	0
<i>Psytalia humilis</i>	4	420	18	4	7
<i>Psytalia concolor</i>	-	-	-	-	-
<i>Diachasmimorpha kraussii</i>	1	125	2	2	0
Unripe Fruit					
Control	2	200	1	-	-
<i>Fopius arisanus</i>	1	75	12	0	0
<i>Psytalia humilis</i>	3	314	1	0	0
<i>Psytalia concolor</i>	-	-	-	-	-
<i>Diachasmimorpha kraussii</i>	-	-	-	-	-

* *Rhagoletis fausta* also infests bitter cherry, preferring unripe fruit. As we were uncertain of the identity of the fly larvae in the fruit, we used unripe fruit (green to orange) and ripe fruit (red and dark red) separately. Flies will be identified to species after they emerge in the summer of 2004.

Table 2. Results of parasitoid exposure to *Chaetorellia succinea* in yellow starthistle flowerheads.

	No. Replicates	No. Flowerheads Infested by Fly	No. Flies Emerging	No. Dead Fly Larvae	No. Parasitoids
Control	15	3	2	1	-
<i>Fopius arisanus</i>	20	7	10	1	0
<i>Psytalia humilis</i>	10	0	0	0	-
<i>Diachasmimorpha kraussii</i>	10	4	2	2	0

¹ University of California, Berkeley, CA.